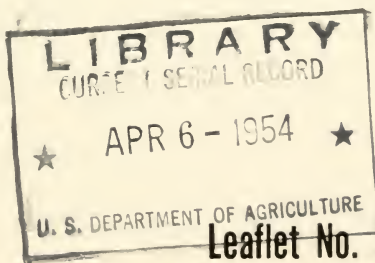


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HYPERKERATOSIS (X-Disease) of Cattle



Leaflet No. 355

U. S. DEPARTMENT OF AGRICULTURE

COOPERATIVE RESEARCH

RESEARCH to find the cause of hyperkeratosis (X-disease) of cattle was carried out, from 1949 to 1953, by scientists of the following States:

ALABAMA	KANSAS	NORTH DAKOTA
COLORADO	MICHIGAN	PENNSYLVANIA
CONNECTICUT	MONTANA	TENNESSEE
GEORGIA	NEBRASKA	TEXAS
ILLINOIS	NEW JERSEY	VIRGINIA
INDIANA	NEW YORK	WISCONSIN

The research was coordinated by the Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture.

The information contained in this leaflet is condensed from scientific papers and reports of many scientists in these 18 States, with the special assistance of Dr. A. M. Lee, who acted as principal coordinator of the cooperative research program.

COVER PHOTO.—This Jersey calf is severely affected with hyperkeratosis (X-disease). The skin of the neck, shoulders, and cheek is ridgy, scurfy, and rough. The calf is shedding tears constantly and licking at the typical watery nasal discharge.

Washington, D. C.

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Hyperkeratosis (X-Disease) of Cattle

Prepared by the Agricultural Research Service

HYPERKERATOSIS, or X-disease, is a disorder of cattle that is often fatal—particularly to calves. Once well on its course there is no known means of halting or curing it, though some animals recover. But, now that scientists have discovered its principal cause, precautions can be taken to prevent heavy losses.

Practically all recent cases of hyperkeratosis have been traced to highly chlorinated naphthalene, a manufactured wax used in certain lubricants. This chemical is used by some manufacturers to lend "body" to greases and oils used under heavy pressures and high temperatures. Following notification by the U. S. Department of Agriculture, lubricant manufacturers making use of this chemical have for the most part taken voluntary steps to refrain from using it in lubricants likely to reach farms. This action should remove much of the hazard to cattle.

The characteristic leathery skin condition was first recognized as something new by Dr. Peter Olafson of the New York Veterinary College, Cornell University, in May 1941. For want of a better name he called it X-disease, the *X* being the mathematical symbol for the unknown.

Dr. Olafson described the ailment as an insidious chronic disease, with a course of several weeks to 3 months or more. Owners reported watery discharge from the eyes and nose as the earliest change seen. This is followed by loss of condition, poor appetite, depression, and progressive thickening of the skin. The skin changes occur over the withers, on the sides of the neck, on the cheeks, and back of the shoulders. The hair is lost and the skin becomes dry, leathery, and deeply creased. Either this change causes little discomfort, or the animal is too depressed to be disturbed. Depression and stupidity are characteristic. Diarrhea is sometimes present: it is most common late in the course of the disease when the animal is obviously dying. Nearly all the animals that show marked skin lesions become emaciated, weak, and finally die.

Drooling by affected animals follows early irritation of the

mouth and the development of wartlike growths on the tongue, dental pad, and cheek. Vitamin A content of the blood becomes extremely low. Post mortems on animals that die show a thick keratinized (horny) layer on the skin of the



Ulcer on dental pad (left) and wartlike lesions on lower gums in experimental animal, Nebraska. This animal also had hyperkeratosis of the skin. Photo by courtesy of Dr. Carl Olson, Jr.

neck, shoulders, and withers—hence the name hyperkeratosis. The gall bladder, liver, pancreas, and kidneys are affected, and there may be abortion and severe mastitis in cows.

Detecting Early Symptoms

Watch for a reddening of the mucous membranes of the mouth, excessive shedding of tears, slobbering, licking into the nostrils, and poor condition. If these symptoms appear, consult a veterinarian.

This is important, for several of these symptoms are the same as those of foot-and-mouth disease, which spreads with great rapidity and can infect many herds unless it is quickly detected and stamped out.

Early diagnosis by a veterinarian is also important if the ailment is X-disease. Access to its causes can be stopped, and further damage to individual animals and to the herd can be prevented. Thickening and folding of the skin is a later symptom, and some losses may occur in a herd if the disease progresses to this point.

What the Farmer Can Do

Prevention is the best cure for X-disease of cattle. The cattle owner can take these steps to prevent occurrence of the disease:

1. Keep cattle away from machinery, or machinery away from cattle, so they cannot lick or come into con-



An extreme case of hyperkeratosis in a grade Hereford at Georgetown, Tenn. In milder cases the skin is not so heavily folded. The animal is depressed and in poor condition, and is licking at the watery nasal discharge.

tact with oil and grease that might contain highly chlorinated naphthalene.

2. Fence off drain pits for oil or places where crank-case oil is dumped.

3. If pelleted feeds are used, insist upon seeing a copy

of the warranty furnished by the oil company to the manufacturer of the pellets that the lubricant used in



Wartlike lesions or blisters on the dental pad in the mouth of a 6-week-old Jersey heifer. In this case, these symptoms appeared early in the course of the disease. The affected herd at Hardaway, Ala., had been fed pelleted feed. Such feed, when contaminated with highly chlorinated naphthalene, causes X-disease.

the pelleting machinery contained no highly chlorinated naphthalene.

4. If used motor oil is employed in devices against which cattle rub to oil themselves, care should be taken not to use "break-in" oil from new motors or oil from vehicles in which an upper-cylinder lubricant has been added to the gasoline.

Should the disease appear in spite of these precautions, the livestock owner is faced with the question of what to do

with his affected animals. If for various reasons it is not desirable to sell them, they may be kept with reasonable hope of recovery provided they are still eating, have no rise in temperature, and show no evidence of secondary infection. Although the disease causes some changes in the sexual organs of both male and female cattle, it does not appear to leave recovered animals permanently impaired. Many that have recovered from the disease have produced normal calves.

Research To Find the Cause

At the time of its first occurrence, nothing was known about the cause of X-disease or whether it could be treated and cured. Treatments were tried, including large doses of sulfa drugs and penicillin and massive doses of several vitamins. Neither drugs nor vitamins had any effect. A baffling thing was that the disease could not be transmitted from one animal to another.

The disease occurred and spread rather slowly. First reported in New York State in 1941, scattered cases appeared in several other States during the next several years. By 1946 the ailment had been reported to the Bureau of Animal Industry from 10 States, and a year later it was known to exist in 27 States. By October 1948 X-disease had been reported in 32 States and a preliminary survey had been completed by four scientists among 26 herds in 20 counties of Alabama, Florida, Georgia, Tennessee, and Virginia. These herds contained 4,120 cattle, of which 1,295, or some 59 percent of the affected animals, had died. Estimated financial loss in the 26 herds was \$110,860, or an average of more than \$4,200 per herd.

Scientific methods were brought to play on the problem in June 1949, when Dr. A. M. Lee of the Bureau of Animal Industry was put in charge of coordinating research to be done in the several States. The disease by this time was causing a loss in cattle estimated at \$2 to \$4 million a year. Deaths from X-disease were highest in calves less than 6 months old, sometimes running 75 or 80 percent. In older calves 50 to 60 percent died. In adult cattle the mortality was 10 to 35 percent.

During the last half of 1949 and the first half of 1950, research men in Colorado, Georgia, Illinois, Indiana, Kansas, Missouri, New York, Ohio, Tennessee, Texas, and Wyoming, after hundreds of trials, failed in their efforts to produce this baffling disease—and they had to be able to produce it in order to identify its cause.

Practically the whole environment of the affected cattle had to be studied—soils, plant life, fertilizers, livestock feeds—with particular reference to new aspects of rural life, for the disease was new. When animals receiving pelleted feeds began to get X-disease, the search shifted to methods of pelleting and to the lubricants used. Finally, after many months of hard work in many States, highly chlorinated naphthalene was found unquestionably to cause the disease.

The Department's Warning

Oil companies and feed manufacturers were alerted to the danger, and they cooperated for the most part in keeping the damaging additive away from livestock and livestock feeds. The Department of Agriculture issued a warning in the spring of 1953. The Department had found that

highly chlorinated naphthalene is still being added to some petroleum lubricants. Such lubricants are sometimes getting into cattle feeds. * * * The purpose of this notice is to emphasize again the danger to all industries concerned, and to point out that serious cattle losses can be prevented if chlorinated naphthalene is eliminated from lubricants used to grease pellet machines and other machinery used to process and harvest livestock feeds. Nothing in this notice is intended to discourage the use of properly formulated grease in pelleting machines or to imply that pellets will cause X-disease unless they are contaminated with chlorinated naphthalene.

A reduced program of research is continuing to investigate other possible causes of the disease, and to examine the possibilities of treatment.

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